METHOD AND APPARATUS FOR GENERATING AND PROCESSING A MAC-EHS PROTOCOL DATA UNIT

VERFAHREN UND VORRICHTUNG ZUM ERZEUGEN UND VERARBEITEN EINER MAC-EHS-PROTOKOLLDATENEINHEIT

PROCÉDÉ ET APPAREIL DE GÉNÉRATION ET DE TRAITEMENT D’UNE UNITÉ DE DONNÉES DE PROTOCOLE MAC-EHS

References cited:

- "Universal Mobile Telecommunications System (UMTS); Medium Access Control (MAC) protocol specification (3GPP TS 25.321 version 7.4.0 Release 7); ETSI TS 125 321" ETSI STANDARDS, LIS, SOPHIA ANTIPOLIS CEDEX, FRANCE, vol. 3-R2, no. V7.4.0, 1 March 2007 (2007-03-01), XP014037915 ISSN: 0000-0001

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• ERICSSON: "L2 enhancements CR to MAC",
3GPP DRAFT; R2-071061, 3RD GENERATION
PARTNERSHIP PROJECT (3GPP), MOBILE
COMPETENCE CENTRE ; 650, ROUTE DES
LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS
CEDEX ; FRANCE, vol. RAN WG2, no. St. Louis,
USA; 20070220, 20 February 2007 (2007-02-20),
XP050134042, [retrieved on 2007-02-20]
Description

FIELD OF INVENTION

[0001] The present invention is related to wireless communications.

BACKGROUND

[0002] High speed packet access (HSPA) evolution refers to the third generation partnership project (3GPP) radio access technology evolution of high speed downlink packet access (HSDPA) and high speed uplink packet access (HSUPA). Some of the major goals of HSPA evolution include higher data rates, higher system capacity and coverage, enhanced support for packet services, reduced latency, reduced operator costs and backward compatibility.

[0003] It has been agreed that an enhanced high speed medium access control (MAC-ehs) entity is extended to include a function for segmentation and multiplexing from different priority queues in addition to being able to receive radio link control (RLC) protocol data units (PDUs) of flexible size. The addition of new MAC-ehs functionalities requires modification to the conventional MAC-ehs architecture.

[0004] Figure 1 shows a universal terrestrial radio access network (UTRAN) side MAC-ehs entity 100 proposed for HSPA evolution. In the proposed MAC-ehs architecture, segmentation is performed per logical channel by segmentation entities 112. The segmented MAC-ehs service data units (SDUs) are then multiplexed by the logical channel identity (LCH-ID) multiplexing entities 114 based on the logical channel identity, and buffered in the configured priority queue 116. A MAC-ehs protocol data unit (PDU) is then generated from the MAC-ehs SDUs stored in the priority queue 116 and transmitted via a hybrid automatic repeat request (HARQ) entity 120.

[0005] Figure 2 shows a user equipment (UE) side MAC-ehs entity 200 proposed for HSPA evolution. The received MAC-ehs PDU via an HARQ entity 202 is disassembled into reordering PDUs by the disassembly entity 204. The reordering PDUs are distributed to a reordering queue 208 by the reordering queue distribution entity 206 based on the received logical channel identifier. The reordering PDUs are reorganized according to the transmission sequence number (TSN). Reordering PDUs with consecutive TSNs are delivered to a higher layer upon reception. A timer mechanism determines delivery of nonconsecutive data blocks to higher layers. There is one reordering entity 208 for each priority class. An LCH-ID demultiplexing entity 210 routes the reordered reordering PDUs to a reassembly entity 212 based on the logical channel identifier. The reassembly entity 212 reassembles segmented MAC-ehs SDUs to original MAC-ehs SDUs and forwards the MAC-ehs SDUs to upper layers.

[0006] The proposed MAC-ehs entity 100 for the UTRAN-side performs segmentation on a per logical channel basis. However, the segmentation of the MAC-d PDUs should not be performed at that level, since the packet will not be transmitted immediately. The multiplexed reordering PDUs are buffered in the priority queue 116 and sent at a later time. Segmentation of the MAC-ehs SDUs prior to knowing the exact channel conditions is inefficient. The segmentation should not be performed prior to the time interval in which the packets will be transmitted. It would be desirable that the segmentation be performed at the time when the MAC-ehs PDU is created and the size of the transport block (TB) for that transmission time interval (TTI) is known. In addition, if the UTRAN is updated to segment the MAC-ehs SDUs right before the MAC-ehs SDUs are sent, the WTRU must also be updated accordingly.

[0007] In the proposed MAC-ehs entity 200 in Figure 2, the LCH-ID de-multiplexing entity 210 routes the MAC-ehs segments to the reassembly entity 212 based on the logical channel identity. This requires reassembly entities for different logical channels within the same queue. In addition, if MAC-ehs headers are optimized, the system information (SI) field will not be present for every logical channel, but it will be present only for the priority queue.

[0008] EP 1 748 593 relates to a method and mobile terminal for performing a data allocation process (E-DCH) medium access control (MAC-e) format and a procedure for generating the MAC-e PDU is disclosed.

[0009] ERICSSON; R2-071586 - MAC OR with optimized MAC-ehs header, 3GPP TSG-RAN WG2 Meeting #56bis, St Louis, Missouri, USA, 12-16 February 2001 discloses segmentation of MAC-d flows on a logical channel basis. The segmented MAC-ehs SDUs are multiplexed to an appropriate priority queue based on the logical channel identity and stored in a priority queue until transmitted later.

SUMMARY

[0010] Apparatuses and methods according to the appended claims are provided. In a Node-B, MAC-ehs SDUs received from an upper layer are multiplexed based on a logical channel identity. Reordering PDUs are generated from the multiplexed MAC-ehs SDUs from different logical channels mapped to a priority queue. A reordering PDU includes at least one MAC-ehs SDU and/or at least one MAC-ehs SDU segment. A MAC-ehs SDU is segmented on a priority class basis if a MAC-ehs SDU does not fit into a reordering PDU. A MAC-ehs PDU is generated including at least one reordering PDU. The multiplexed MAC-ehs SDUs may be stored in a corresponding priority queue before generating the reordering PDUs. Alternatively, the reordering PDUs may be generated from the multiplexed MAC-ehs SDUs and the reordering PDUs may be stored in a corresponding priority queue. Alternatively, the received MAC-ehs SDUs may be buffered in a corresponding buffer for each logical channel before multiplexed based on a logical channel.
A more detailed understanding may be had from the following description, given by way of example and to be understood in conjunction with the accompanying drawings wherein:

Figure 1 shows a UTRAN-side MAC-ehs entity proposed for HSPA evolution;
Figure 2 shows a UE-side MAC-ehs entity proposed for HSPA evolution;
Figures 3-4 show a UTRAN-side MAC-ehs entity in accordance with one embodiment;
Figure 5 shows a UTRAN-side MAC-ehs entity in accordance with another embodiment;
Figures 6-8 show a UTRAN-side MAC-ehs entity in accordance with another embodiment;
Figure 9 shows a UTRAN-side MAC-ehs entity in accordance with another embodiment; and
Figure 10 shows a WTRU-side MAC-ehs entity in accordance with one embodiment.

Detailed Description

When referred to hereafter, the terminology "wireless transmit/receive unit (WTRU)" includes but is not limited to a UE, a mobile station, a fixed or mobile subscriber unit, a pager, a cellular telephone, a personal digital assistant (PDA), a computer, or any other type of user device capable of operating in a wireless environment. When referred to hereafter, the terminology "Node-B" includes but is not limited to a base station, a site controller, an access point (AP), or any other type of interfacing device capable of operating in a wireless environment.

The terminology "MAC-ehs payload unit" or "payload unit" will refer to a MAC-ehs SDU or a MAC-ehs SDU segment that is inserted as a payload of a MAC-ehs PDU. The terminology "MAC-d flow" and "logical channel" are used interchangeably, and use of one term does not exclude the other. The terminology "reordering PDU" refers to one unit of a MAC-ehs PDU. The MAC-ehs PDU may include one or more reordering PDUs. The reordering PDU may include one or more payload units. The MAC-ehs SDU may be a MAC-d PDU, MAC-c/sh/m PDU, or the like.

Figure 3 shows a UTRAN-side MAC-ehs entity 300 in accordance with one embodiment. The MAC-ehs entity 300 includes a scheduling and priority handling entity 310, an HARQ entity 320, and a transport format and resource combination (TFRC) selection entity 330. The scheduling and priority handling entity 310 includes priority queues 314, segmentation entities 316, and a priority queue multiplexing entity 318. The scheduling and priority handling entity 310 manages HS-DSCH resources for data flows according to their priority class. The HARQ entity 320 handles HARQ functionality for supporting multiple instances (HARQ process) of stop and wait HARQ protocols. The TFRC selection entity 330 selects a TFRC.

The MAC-ehs entity 300 receives MAC-ehs SDUs from an upper layer, (e.g., MAC-d or MAC-c entity (not shown)). The LCH-ID multiplexing entity 312 may multiplex the MAC-ehs SDUs from multiple logical channels based on the scheduling decision and the TFRC selected by the TFRC selection entity 330. The TFRC selection entity 330 indicates to the scheduling and priority handling entity 310 the size of the MAC-ehs PDU and thus the size of data to be transmitted from each queue into a reordering PDU to be transmitted on a TTI basis. The multiplexed MAC-ehs SDUs are stored in a priority queue 314.

The segmentation entity 316 may segment the MAC-ehs SDUs per priority queue. The segmentation entity 316 segments a MAC-ehs SDU if the MAC-ehs SDU does not fit into a reordering PDU. For example, if the MAC-ehs SDU to be included in the reordering PDU is greater than the size of the reordering PDU, or it causes the sum of payload units to exceed the size of the selected reordering PDU, the segmentation entity 316 segments the MAC-ehs SDU. In this case, the reordering PDU includes only one segment of the MAC-ehs SDU. The remaining segment of the MAC-ehs SDU after segmentation is stored in the segmentation entity and may be transmitted as the first payload unit in the next reordering PDU for the priority queue if the remaining segment fits into the next reordering PDU. The remaining segment of the MAC-ehs SDU is segmented again if the remaining segment still does not fit into the next reordering PDU. This may be repeated until all the parts of the MAC-ehs SDU have been transmitted. The reordering PDU will contain at most two segments, one at the beginning and one at the end, and may include zero, one, or more than one complete MAC-ehs SDUs.

The segmentation entity 316 may base its segmentation decision on the current channel condition, the given transport format and resource combination (TFRC) selection, the reordering PDU size, and the like. The segmentation is performed on a priority queue basis instead of on a per logical channel basis.

The priority queue multiplexing entity 318 may perform multiplexing of reordering PDUs in one MAC-ehs PDU. The priority queue multiplexing entity 318 selects one or more reordering PDUs from one or more priority queues 314 in order to create the MAC-ehs PDU based on the TFRC selection.

The priority queue multiplexing entity 318 may be incorporated into the HARQ entity 320. The TFRC selection entity 330 may be attached to the scheduling and priority handling entity 310, as shown in Figure 4.

Figure 5 shows a UTRAN-side MAC-ehs entity 500 in accordance with another embodiment. In this embodiment, the segmentation is performed on a priority queue basis after logical channel multiplexing. The MAC-
The priority queue multiplexing entity 618 may be segmented by the segmentation entity 616 and may be transmitted as the first payload unit in the next reordering PDU for the priority queue if the remaining segment fits into the next reordering PDU. The remaining segment of the MAC-ehs SDU is segmented again if the remaining segment still does not fit into the next reordering PDU. This may be repeated until all the parts of the MAC-ehs SDU have been transmitted. The reordering PDU contains at most two segments, one at the beginning and one at the end, and may include zero, one, or more than one MAC-ehs SDUs.

Reordering PDUs are stored in a priority queue 516. The priority queue multiplexing entity 518 may perform multiplexing of reordering PDUs in one MAC-ehs PDU. The priority queue multiplexing entity 518 selects one or more reordering PDUs from the priority queues 612 in order to create the MAC-ehs PDU.

The priority queue multiplexing entity 518 may be incorporated into the HARQ entity 520. The TFRC selection entity 530 may be attached to the scheduling and priority handling entity 510, the HARQ entity 520, and the TFRC selection entity 530. The scheduling and priority handling entity 510 selects a TFRC. The scheduling and priority handling entity 510 includes LCH-ID multiplexing entities 512, segmentation entities 514, priority queues 516, and a priority queue multiplexing entity 518. The scheduling and priority handling entity 510 manages HS-DSDCH resources for data flows according to their priority class. The HARQ entity 520 handles HARQ functionality for supporting multiple instances (HARQ process) of stop and wait HARQ protocols. The TFRC selection entity 530 selects a TFRC.

The MAC-ehs entity 500 includes a scheduling and priority handling entity 510, an HARQ entity 520, and a TFRC selection entity 530. The scheduling and priority handling entity 510 includes LCH-ID multiplexing entities 512, segmentation entities 514, priority queues 516, and a priority queue multiplexing entity 518. The scheduling and priority handling entity 510 selects multiple instances (HARQ process) of stop and wait data flows according to their priority class. The HARQ queue multiplexing entity 518. The scheduling and priority handling entity 510, an HARQ entity 520, and a TFRC selection entity 530. The scheduling and priority handling entity 510 includes LCH-ID multiplexing entities 512, segmentation entities 514, priority handling entities 516 in order to create the MAC-ehs PDU. The remaining segment of the MAC-ehs SDU is segmented again if the remaining segment still does not fit into the next reordering PDU. This may be repeated until all the parts of the MAC-ehs SDU have been transmitted. The reordering PDU contains at most two segments, one at the beginning and one at the end, and may include zero, one, or more than one MAC-ehs SDUs.

The priority queue multiplexing entity 518 may be incorporated into the HARQ entity 520. The TFRC selection entity 530 may be attached to the scheduling and priority handling entity 510, the HARQ entity 520, and the TFRC selection entity 530. The scheduling and priority handling entity 510 includes LCH-ID multiplexing entities 512, segmentation entities 514, priority queues 516, and a priority queue multiplexing entity 518. The scheduling and priority handling entity 510 manages HS-DSDCH resources for data flows according to their priority class. The HARQ entity 520 handles HARQ functionality for supporting multiple instances (HARQ process) of stop and wait HARQ protocols. The TFRC selection entity 530 selects a TFRC.

The MAC-ehs entity 500 receives MAC-ehs SDUs from an upper layer. The LCH-ID multiplexing entity 512 may multiplex MAC-ehs SDUs from multiple logical channels based on the scheduling decision and optionally based on the TFRC selected by the TFRC selection entity 530. The TFRC selection entity 530 indicates to the scheduling and priority handling entity 510 the size of the MAC-ehs PDU to be transmitted on a TTI basis. The MAC-ehs entity 500 in accordance with another embodiment, the MAC-ehs SDUs are buffered per logical channel rather than per data from different logical channels may flow directly from upper layers to the corresponding LCH-ID multiplexing entities 614. The LCH-ID multiplexing entities 614 multiplexes MAC-ehs SDUs stored in the queues 612 or received from the corresponding logical channels based on scheduling decision, scheduling priority and the TFRC selected by the TFRC selection entity 630. Based on the TFRC selection and the selected reordering PDU size, the MAC-ehs SDUs may be segmented by the segmentation entity 616. The segmentation entity 616 segments a MAC-ehs SDU if the MAC-ehs SDU does not fit into a reordering PDU. For example, if the MAC-ehs SDU to be included in the reordering PDU is greater than the size of the reordering PDU or it causes the sum of payload units to exceed the size of the reordering PDU, the segmentation entity 616 segments the MAC-ehs SDU. In this case, the reordering PDU includes only one segment of the MAC-ehs SDU. The remaining segment of the MAC-ehs SDU after segmentation is stored in the segmentation entity 616 and may be transmitted as the first payload unit in the next reordering PDU for the priority queue if the remaining segment fits into the next reordering PDU. The remaining segment of the MAC-ehs SDU is segmented again if the remaining segment still does not fit into the next reordering PDU. This may be repeated until all the parts of the MAC-ehs SDU have been transmitted. The reordering PDU contains at most two segments, one at the beginning and one at the end, and may include zero, one, or more than one MAC-ehs SDUs.

The priority queue multiplexing entity 618 defines relative priorities between sets of logical channels (and/or MAC-d flows), and optionally assigns TSNs. The priority queue multiplexing entity 619 performs multiplexing of reordering PDUs in one MAC-ehs PDU.

The priority handling entity 618 and its functionalities may be incorporated in the priority queue multiplexing entity 619, as shown in Figure 7, (i.e., priority queue multiplexing and TSN setting entity 702). The segmentation entity 616 or the LCH-ID multiplexing entity 614 may be extended to buffer segments of the MAC-ehs SDUs. The TFRC selection entity 630 may be attached to the scheduling and priority handling entity 610, as shown in Figure 8.

The priority handling entity 618 and its functionalities may be incorporated in the priority queue multiplexing entity 619, as shown in Figure 7, (i.e., priority queue multiplexing and TSN setting entity 702). The segmentation entity 616 or the LCH-ID multiplexing entity 614 may be extended to buffer segments of the MAC-ehs SDUs. The TFRC selection entity 630 may be attached to the scheduling and priority handling entity 610, as shown in Figure 8.

The MAC-ehs entity 600 receives MAC-ehs SDUs from upper layers. MAC-ehs SDUs are stored in queues 612 on a logical channel basis. Alternatively, the queues 612 may not be present and data from different logical channels may flow directly from upper layers to the corresponding LCH-ID multiplexing entities 614. The LCH-ID multiplexing entities 614 multiplexes MAC-ehs SDUs stored in the queues 612 or received from the corresponding logical channels based on scheduling decision, scheduling priority and the TFRC selected by the TFRC selection entity 630. Based on the TFRC selection and the selected reordering PDU size, the MAC-ehs SDUs may be segmented by the segmentation entity 616. The segmentation entity 616 segments a MAC-ehs SDU if the MAC-ehs SDU does not fit into a reordering PDU. For example, if the MAC-ehs SDU to be included in the reordering PDU is greater than the size of the reordering PDU or it causes the sum of payload units to exceed the size of the reordering PDU, the segmentation entity 616 segments the MAC-ehs SDU. In this case, the reordering PDU includes only one segment of the MAC-ehs SDU. The remaining segment of the MAC-ehs SDU after segmentation is stored in the segmentation entity 616 and may be transmitted as the first payload unit in the next reordering PDU for the priority queue if the remaining segment fits into the next reordering PDU. The remaining segment of the MAC-ehs SDU is segmented again if the remaining segment still does not fit into the next reordering PDU. This may be repeated until all the parts of the MAC-ehs SDU have been transmitted. The reordering PDU contains at most two segments, one at the beginning and one at the end, and may include zero, one, or more than one MAC-ehs SDUs.

The priority handling entity 618 and its functionalities may be incorporated in the priority queue multiplexing entity 619, as shown in Figure 7, (i.e., priority queue multiplexing and TSN setting entity 702). The segmentation entity 616 or the LCH-ID multiplexing entity 614 may be extended to buffer segments of the MAC-ehs SDUs. The TFRC selection entity 630 may be attached to the scheduling and priority handling entity 610, as shown in Figure 8.

The priority handling entity 618 and its functionalities may be incorporated in the priority queue multiplexing entity 619, as shown in Figure 7, (i.e., priority queue multiplexing and TSN setting entity 702). The segmentation entity 616 or the LCH-ID multiplexing entity 614 may be extended to buffer segments of the MAC-ehs SDUs. The TFRC selection entity 630 may be attached to the scheduling and priority handling entity 610, as shown in Figure 8.

The priority handling entity 618 and its functionalities may be incorporated in the priority queue multiplexing entity 619, as shown in Figure 7, (i.e., priority queue multiplexing and TSN setting entity 702). The segmentation entity 616 or the LCH-ID multiplexing entity 614 may be extended to buffer segments of the MAC-ehs SDUs. The TFRC selection entity 630 may be attached to the scheduling and priority handling entity 610, as shown in Figure 8.
916, priority handling entities 918, and a priority queue multiplexing entity 919. The scheduling and priority handling entity 910 manages HS-DSCH resources for data flows according to their priority class. The HARQ entity 920 handles HARQ functionality for supporting multiple instances (HARQ process) of stop and wait HARQ protocols. The TFRC selection entity 930 selects a TFRC.

[0030] The MAC-ehs entity 900 receives MAC-ehs SDUs from upper layers. MAC-ehs SDUs from logical channels, (or MAC-d flows), are stored in queues 912 for each logical channel or alternatively are directly delivered from upper layers without any buffering. The MAC-ehs SDUs may then be segmented by the segmentation entity 914. The segmentation entity 914 segments a MAC-ehs SDU if the MAC-ehs SDU does not fit into a reordering PDU as selected by the TFRC selection. The reordering PDU contains at most two segments, one at the beginning and one at the end, and may include zero, one, or more than one MAC-ehs SDUs. The LCH-ID multiplexing entity 916 then multiplexes reordering PDUs from multiple logical channels, (i.e., multiple MAC-d flows), based on the scheduling decision and the TFRC selected by the TFRC selection entity 930.

[0031] The priority handling entity 918 defines relative priorities between sets of logical channels (and/or MAC-d flows), and optionally assigns TSNs. Alternatively, the TSNs setting may be performed per logical channel instead of per priority queue. The priority queue multiplexing entity 919 performs multiplexing of reordering PDUs in one MAC-ehs PDU. The priority handling entity and its functionality 918 may be incorporated in the priority queue multiplexing entity 919. Alternatively, the LCH-ID MUX and priority queue multiplexing may be combined in one entity and multiplexing may be performed only on one level, on a logical channel basis.

[0032] The segmentation entity 914 or the LCH-ID multiplexing entity 916 may be extended to buffer outstanding segments of the MAC-ehs SDUs. The TFRC selection entity 930 may be attached to the scheduling and priority handling entity 910.

[0033] Figure 10 shows a WTRU-side MAC-ehs entity 1000 in accordance with one embodiment. Since in the UTRAN may perform segmentation after multiplexing logical channels in the mapped priority queue, the conventional WTRU-side MAC-ehs entity is modified to reflect these changes and to perform the reassembly and de-multiplexing in the same order. If segmentation is performed on a per priority queue basis, reassembly should be based on the reordering queue segmentation information.

[0034] The MAC-ehs entity 1000 includes an HARQ entity 1002, a disassembly entity 1004, a reordering queue distribution entity 1006, reordering queues 1008, SDU disassembly entities 1010, reassembly entities 1012, and LCH-ID demultiplexing entities 1014. The transmitted MAC-ehs PDUs are received via the HARQ entity 1002. The disassembly entity 1004 disassembles the MAC-ehs PDU to reordering PDUs. The reordering queue distribution entity 1006 distributes the reordering PDUs to an appropriate reordering queue 1008 based on the logical channel identity. The reordering PDUs are reordered at the reordering queue 1008 based on the TSN. The SDU disassembly entity 1010 disassembles MAC-ehs SDUs and segmented MAC-ehs SDUs from the reordered reordering PDUs, and delivers them to the reassembly entity 1012. The reassembly entity 1012 reassembles segmented MAC-ehs SDUs to original MAC-ehs SDUs for every reordering PDU and forwards the completed and reassembled MAC-ehs SDUs to the LCH-ID demultiplexing entity 1014. The LCH-ID demultiplexing entity 1014 routes the complete MAC-ehs SDUs to the correct logical channel, or MAC-d flow. Optionally, the SDU disassembly entity 1010 and the reassembly entity 1012 may be combined to one entity.

[0035] Although the features and elements of the present invention are described in the preferred embodiments in particular combinations, each feature or element can be used alone without the other features and elements of the preferred embodiments or in various combinations with or without other features and elements of the present invention. The methods or flow charts provided in the present invention may be implemented in a computer program, software, or firmware tangibly embodied in a computer-readable storage medium for execution by a general purpose computer or a processor. Examples of computer-readable storage mediums include a read only memory (ROM), a random access memory (RAM), a register, cache memory, semiconductor memory devices, magnetic media such as internal hard disks and removable disks, magnetooptical media, and optical media such as CD-ROM disks, and digital versatile disks (DVDs).

[0036] Suitable processors include, by way of example, a general purpose processor, a special purpose processor, a conventional processor, a digital signal processor (DSP), a plurality of microprocessors, one or more microprocessors in association with a DSP core, a controller, a microcontroller, Application Specific Integrated Circuits (ASICs), Field Programmable Gate Arrays (FPGAs) circuits, any other type of integrated circuit (IC), and/or a state machine.

[0037] A processor in association with software may be used to implement a radio frequency transceiver for use in a wireless transmit receive unit (WTRU), user equipment (UE), terminal, base station, radio network controller (RNC), or any host computer. The WTRU may be used in conjunction with modules, implemented in hardware and/or software, such as a camera, a video camera module, a videophone, a speakerphone, a vibration device, a speaker, a microphone, a television transceiver, a hands free headset, a keyboard, a Bluetooth® module, a frequency modulated (FM) radio unit, a liquid crystal display (LCD) display unit, an organic light-emitting diode (OLED) display unit, a digital music player, a media player, a video game player module, an Internet browser, and/or any wireless local area network (WLAN)
module.

Claims

1. A method performed by a wireless communication unit, the method comprising:
   receiving a service data unit, SDU, from at least one logical channel;
   characterised by:
   providing the SDU to a priority queue, wherein the priority queue comprises SDUs from other logical channels;
   generating an enhanced high speed medium access control, MAC-ehs, reordering protocol data unit, PDU, the MAC-ehs reordering PDU including a segment of the SDU in the priority queue, wherein the SDU is segmented by a segmentation function associated with the priority queue;
   generating a MAC-ehs PDU, including the MAC-ehs reordering PDU; and
   sending the MAC-ehs PDU via a high speed downlink shared channel, HS-DSCH.

2. The method of claim 1 wherein the receiving the SDU includes receiving a MAC-ehs SDU.

3. The method of claim 1 wherein the receiving the SDU includes receiving a plurality of SDUs via a plurality of logical channels.

4. The method of claim 1, further comprising:
   segmenting the SDU into a plurality of segments, wherein the plurality of segments includes the segment from the SDU.

5. The method of claim 4 wherein the segmenting is based on any one of a current channel condition, a selected transport format and resource combination, TFRC, or a size of the MAC-ehs reordering PDU.

6. The method of claim 1 wherein the generating a reordering PDU includes generating a first reordering PDU and generating a second reordering PDU, and the generating the MAC-ehs PDU includes having the first reordering PDU and the second reordering PDU in the MAC-ehs PDU.

7. A Node-B comprising:
   circuitry configured to receive a service data unit, SDU, from at least one logical channel;
   characterised by:
   a priority queue configured to have the SDU, wherein the priority queue comprises SDUs from other logical channels;
   a segmentation function associated with the priority queue and configured to provide an enhanced high speed medium access control, MAC-ehs, reordering protocol data unit, PDU, the MAC-ehs reordering PDU including a segment of the SDU in the priority queue;
   circuitry configured to generate a MAC-ehs PDU, the MAC-ehs PDU including the MAC-ehs reordering PDU; and
   circuitry configured to send the MAC-ehs PDU via a high speed downlink shared channel, HS-DSCH.

8. The Node-B of claim 7 wherein the received SDU is a MAC-ehs SDU.

9. The Node-B of claim 7 further comprising:
   circuitry configured to receive a plurality of SDUs via a plurality of logical channels.

10. The Node-B of claim 7 wherein the segmentation function is configured to segment the SDU into a plurality of segments, wherein the plurality of segments includes the segment from the SDU.

11. The Node-B of claim 10 wherein the segmentation function is configured to segment based on any one of a current channel condition, a selected transport format and resource combination, TFRC, or a size of the MAC-ehs reordering PDU.

12. The Node-B of claim 7 wherein the segmentation function is configured to generate a first reordering PDU and a second reordering PDU, and the circuitry configured to include the first reordering PDU and the second reordering PDU in the MAC-ehs PDU.

Patentansprüche

1. Verfahren, das durch eine Drahtloskommunikationseinheit ausgeführt wird, wobei das Verfahren Folgendes umfasst:
   Empfangen einer Service Data Unit (SDU) von mindestens einem logischen Kanal;
   gekennzeichnet durch:
   Einreihen der SDU in eine Prioritätswarteschlange, wobei die Prioritätswarteschlange SDUs von anderen logischen Kanälen umfasst;
   Generieren einer Enhanced High Speed
Medium Access Control (MAC-ehs)-Neuordnungs-Protocol Data Unit (PDU), wobei die MAC-ehs-Neuordnungs-PDU ein Segment der SDU in der Prioritätswarteschlange enthält, wobei die SDU durch eine zu der Prioritätswarteschlange gehörige Segmentierungsfunktion segmentiert wird; Generieren einer MAC-ehs-PDU, die die MAC-ehs-Neuordnungs-PDU enthält; und Senden der MAC-ehs-PDU über einen High Speed Downlink Shared Channel (HS-DSCH).

2. Verfahren nach Anspruch 1, wobei das Empfangen der SDU das Empfangen einer MAC-ehs-SDU enthält.

3. Verfahren nach Anspruch 1, wobei das Empfangen der SDU das Empfangen von mehreren SDUs über mehrere logische Kanäle enthält.

4. Verfahren nach Anspruch 1, das des Weiteren Folgendes umfasst:
   Segmentieren der SDU in mehrere Segmente, wobei die mehreren Segmente das Segment von der SDU enthalten.

5. Verfahren nach Anspruch 4, wobei das Segmentieren auf eines von Folgendem gestützt wird: einen momentanen Kanalzustand, eine ausgewählte Transportformat- und Ressourcenkombination (TFRC) oder eine Größe der MAC-ehs-Neuordnungs-PDU.


7. Knoten-B, der Folgendes umfasst:
   Schaltungen, die dafür konfiguriert sind, eine Service Data Unit (SDU) von mindestens einem logischen Kanal zu empfangen; gekennzeichnet durch:
   eine Prioritätswarteschlange, die dafür konfiguriert ist, die SDU zu haben, wobei die Prioritätswarteschlange SDUs von anderen logischen Kanälen umfasst; eine Segmentierungsfunktion, die zu der Prioritätswarteschlange gehört und die dafür konfiguriert ist, eine Enhanced High Speed Medium Access Control (MAC-ehs)-Neuordnungs-Protocol Data Unit (PDU) bereitzustellen, wobei die MAC-ehs-Neuordnungs-PDU ein Segment der SDU in der Prioritätswarteschlange enthält; Schaltungen, die dafür konfiguriert sind, eine MAC-ehs-PDU zu generieren, wobei die MAC-ehs-PDU die MAC-ehs-Neuordnungs-PDU enthält; und Schaltungen, die dafür konfiguriert sind, die MAC-ehs-PDU über einen High Speed Downlink Shared Channel (HS-DSCH) zu senden.

8. Knoten-B nach Anspruch 7, wobei die empfangene SDU eine MAC-ehs-SDU ist.

9. Knoten-B nach Anspruch 7, der des Weiteren Folgendes umfasst:
   Schaltungen, die dafür konfiguriert sind, mehrere SDUs über mehrere logische Kanäle zu empfangen.

10. Knoten-B nach Anspruch 7, wobei die Segmentierungsfunktion dafür konfiguriert ist, die SDU in mehrere Segmente zu segmentieren, wobei die mehreren Segmente das Segment von der SDU enthalten.

11. Knoten-B nach Anspruch 10, wobei die Segmentierungsfunktion dafür konfiguriert ist, auf der Basis eines von Folgendem zu segmentieren:
   einem momentanen Kanalzustand, einer ausgewählten Transportformat- und Ressourcenkombination (TFRC), oder einer Größe der MAC-ehs-Neuordnungs-PDU.

12. Knoten-B nach Anspruch 7, wobei die Segmentierungsfunktion dafür konfiguriert ist, eine erste Neuordnungs-PDU und eine zweite Neuordnungs-PDU zu generieren, und die Schaltungen dafür konfiguriert sind, die erste Neuordnungs-PDU und die zweite Neuordnungs-PDU in die MAC-ehs-PDU einzubinden.

Revendications

1. Procédé effectué par une unité de communication sans fil, le procédé incluant :
   la réception d’une unité de données de service, SDU, d’au moins un canal logique ; caractérisé par :
   la fourniture de la SDU à une file d’attente de priorité, dans lequel la file d’attente de priorité inclut des SDU d’autres canaux.
la génération d’une unité de données de protocole, PDU, de réordonnancement de commande d’accès au support amélioré à grande vitesse, MAC-ehs, la PDU de réordonnancement de MAC-ehs incluant un segment de la SDU dans la file d’attente de priorité, dans lequel la SDU est segmentée par une fonction de segmentation associée à la file d’attente de priorité ;
la génération d’une PDU MAC-ehs incluant la PDU de réordonnancement de MAC-ehs ; et
l’envoi de la PDU MAC-ehs par l’intermédiaire d’un canal partagé de liaison descendante à grande vitesse, HS-DSCH.

2. Procédé selon la revendication 1, dans lequel la réception de la SDU comprend la réception d’une SDU MAC-ehs.

3. Procédé selon la revendication 1, dans lequel la réception de la SDU comprend la réception d’une pluralité de SDU par l’intermédiaire d’une pluralité de canaux logiques.

4. Procédé selon la revendication 1, comprenant en outre :

la segmentation de la SDU en une pluralité de segments, dans lequel la pluralité de segments inclut le segment de la SDU.

5. Procédé selon la revendication 4, dans lequel la segmentation est basée sur l’une quelconque d’une condition de canal actuelle, d’une combinaison de format de transport et de ressources, TFRC, sélectionnée, ou d’une taille de la PDU de réordonnancement de MAC-ehs.

6. Procédé selon la revendication 1, dans lequel la génération d’une PDU de réordonnancement comprend la génération d’une première PDU de réordonnancement et d’une deuxième PDU de réordonnancement, et la génération de la PDU MAC-ehs comprend l’inclusion de la première PDU de réordonnancement et de la deuxième PDU de réordonnancement dans la PDU MAC-ehs.

7. Noeud B comprenant :

une circuiterie configurée pour recevoir une unité de données de service, SDU, d’au moins un canal logique ;

caractérisé par :

une file d’attente de priorité configurée pour avoir la SDU, dans lequel la file d’attente de priorité inclut des SDU d’autres canaux logiques ;
une fonction de segmentation associée à la file d’attente de priorité et configurée pour fournir une unité de données de protocole, PDU, de réordonnancement, de commande d’accès au support amélioré à grande vitesse, MAC-ehs, la PDU de réordonnancement MAC-ehs incluant un segment de la SDU dans la file d’attente de priorité ;
une circuiterie configurée pour générer une PDU MAC-ehs, la PDU MAC-ehs incluant la PDU de réordonnancement MAC-ehs ; et
une circuiterie configurée pour envoyer la PDU MAC-ehs par l’intermédiaire d’un canal partagé de liaison descendante à grande vitesse, HS-DSCH.

8. Noeud B selon la revendication 7, dans lequel la SDU reçue est une SDU MAC-ehs.

9. Noeud B selon la revendication 7, comprenant en outre :

une circuiterie configurée pour recevoir une pluralité de SDU par l’intermédiaire d’une pluralité de canaux logiques.

10. Noeud B selon la revendication 7, dans lequel la fonction de segmentation est configurée pour segmenter la SDU en une pluralité de segments, dans lequel la pluralité de segments inclut le segment de la SDU.

11. Noeud B selon la revendication 10, dans lequel la fonction de segmentation est configurée pour segmenter sur la base de l’une quelconque d’une condition de canal actuelle, d’une combinaison de format de transport et de ressources, TFRC, sélectionnée, ou d’une taille de la PDU de réordonnancement de MAC-ehs.

12. Noeud B selon la revendication 7, dans lequel la fonction de segmentation est configurée pour effectuer la génération d’une première PDU de réordonnancement et d’une deuxième PDU de réordonnancement, et la circuiterie est configurée pour inclure la première PDU de réordonnancement et la deuxième PDU de réordonnancement dans la PDU MAC-ehs.
MAC-ehs

MAC-d

REASSEMBLY ENTITY

LCH-ID DEMULTIPLEXING ENTITY

REORDERING QUEUE

LCH-ID DEMULTIPLEXING ENTITY

REORDERING QUEUE

RE-ORDERING QUEUE DISTRIBUTION ENTITY

DISASSEMBLY ENTITY

HARQ ENTITY

ASSOCIATED DOWNLINK SIGNALLING

HS-DSCH

ASSOCIATED UPLINK SIGNALLING

MAC-CONTROL

FIG. 2
PRIOR ART
FIG. 8
REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

• EP 1748593 A [0008]

Non-patent literature cited in the description

• ERICSSON. R2-071586 - MAC OR with optimized MAC-ehs header. 3GPP TSG-RAN WG2 Meeting #56bis, St Louis, Missouri, USA, 12 February 2001 [0009]